New Technology Committee

Report to the Southern Regional Cooperative Soil Survey Conference.

Gainesville, Florida, July 14-15, 2008.

Committee Members In Attendance

Dr. Sabine Grunwald, Co-Chair University of Florida
Dwain Daniels, Co-Chair, NRCS, Fort Worth, TX
Sharon Waltman, Representing Jon Hempel, Chair NCSS Standing Committee on New Technology, NRCS, West Virginia
Luiz Hernandez, NRCS, Arkansas
Dennis Williamson, NRCS, Texas
Milton Cortes, NRCS, North Carolina

Meeting Participants

Katrina Hutchinson, Texas A&M University
Martin Figeuroa, NRCS, FL
Jim Fortner, NRCS, NSSC, NE
Victoria Gardner, NRCS, FL
Jinseok Hong, Univ. Of Florida
David Howell, NRCS, FL
Doug Lewis, NRCS, FL
Milton Martinez, NRCS, FL
Rick Robbins, NRCS, FL
Deoyani Sarkhot, Univ. Of Florida
Gustavo Vasques, Univ. Of Florida

Members not attending.

Joe Gardinski, NRCS, Alabama
Drew Kinney, NRCS, Texas
David McMillian, NRCS, Tennessee
Rick Livingston, NRCS, Tennessee
Delaney Johnson, NRCS, Mississippi
Alan Stahnke, NRCS, Texas
Lynn Loomis, NRCS, Texas
Jim Henley, NRCS, Oklahoma

Charge 1

Identify potential new technologies to support field activities in the processing of existing digital spatial data

a) NCSS cooperators should take an active role in submitting proposals for multi-entity acquisitions of high resolution elevation data (LIDAR, IFSAR) and other remote sensing products.
b) Apply GIS analysis to improve initial and update project soil survey.
   i) Pedon point data spatially joined to mapunit polygons, preprocessed and ready for use in correlation.
   ii) Geostatistical tool for analysis of pedon description and laboratory analysis results to determine mapunit composition, distribution, and extent.
   iii) Automated process models to produce primary and secondary terrain derivatives from multiple resolution (LIDAR, IFSAR, hypsographic) elevation raster datasets. Be able to perform analysis in office and on-site.
c) Delivery of preprocessed products to NCSS cooperators.
   i) Provision data to the field with ready to use map document templates equipped with standardized coordinate system, symbology and labeling of a selection of ancillary data layers. The user can modify the symbology or labeling as needed.
   ii) Soil spatial data is delivered ready to use with tabular data already incorporated in a variety of GIS formats.
   iii) Provide static datasets accessible for use through web services with the functionality to clip and download the data within an AOI for use in the field.
   iv) Provide SSURGO datasets at MLRA extent in 10m raster format.
d) Extend Soil Data Mart and Soil Data Viewer functionality to work with File and Enterprise Geodatabase vector and raster formats to enable larger areas including Series Extent mapping functions. Soil spatial data is delivered ready to use with tabular data already incorporated in the file geodatabase.
e) Acquire improved ruggedized equipment for field data collection, including mobile computers, data collectors, and digital cameras with integrated GPS.
f) Acquire improved computer hardware for high capacity data storage with increased security and integrity.

Formatted: Font: Verdana

Charge 2

Identify new technologies and methodologies that can support and/or enhance digital soil survey activities

a) Apply SCORPAN model (McBratney et al. 2003) (based on soil forming factor model - Soil, Climate, Organism, Relief, Parent Material, Age, Geographic Location, based on statistical/geostatistical models) or knowledge based mapping in GIS environment.
   i) Derive continuous layers of soil properties for input into model in adherence to the FGDC's National Standard of Spatial Data Accuracy.
   ii) Continuous update/regeneration of soil property layers with new observations.

b) Implement improved monitoring and data collection technologies.
   i) On-site in-situ environmental data collection, including but not limited to water table, air temperature, soil temperature and soil moisture.
   ii) Utilize new sensors such as proximal visible and near-infrared diffuse reflectance spectroscopy VNIR-DRS, EC, moisture, resistance.
   iii) When applicable collect concurrently with high precision/high accuracy GPS.
   iv) Acquire software for spectrometry data processing and statistical analysis.
   v) Optimize data collection with automated data loggers both mobile sensors and stationary monitoring sites.
   vi) Develop a database model and strategy (including quality control) for upload to a central repository facilitating incorporation into existing soil database structure.

c) Construct a geographically diverse soil-spectral library for visible and near-infrared diffuse reflectance spectroscopy VNIR-DPS calibration.

d) Develop pedo-transfer functions to predict soil properties from available soil data combined with GIS landscape datasets.

e) Develop and distribute a catalog of MSS band ratio's that have been documented to identify different lithologic conditions.

Formatted: Font: Verdana

Ref:

McBratney A.B., M.L. Mendona Santos, and B. Minasny. 2003. On digital soil mapping. Geoderma 117: 3-52.

Charge 3 and 4

3) Identify the need for soil property maps, the required map scales for soil property maps and what soil properties to map. 4) Identify customers who require soil property maps

Customers	Content	Scale
Meteorological modelers (crop models, global change, soil carbon, etc.)	-%sand, %silt, %clay -rock fragment content Layer depths, 3D model Available water capacity Rooting depth Bulk Density Soil organic carbon Soil inorganic carbon Total carbon And other related layers	1:12,000, 10m 1:24,000, 30m 1:250,000, 90m –1km
Hydrologic modelers	-%sand, %silt, %clay -rock fragment content Layer depths, 3D model Available water capacity Bulk Density Rooting depth Soil organic carbon Soil inorganic carbon Total carbon And other related layers	1:12,000, 10m 1:24,000, 30m 1:250,000, 90m –1km
Farm Service Agency	soil crop productivity indices	1:12,000, 10m 1:24,000, 30m
Land developers Reclamation/remediation officials	Land capability class Infiltration Rate	1: 6,000, 5m 1:12,000, 10m 1:24,000, 30m

Private consultants University Consultants	-%sand, %silt, %clay -rock fragment content Bulk Density Layer depths Available water capacity Infiltration rate Ksat Rooting depth Soil organic carbon Soil inorganic carbon Total carbon And other related layers	1:6,000, 5m 1:12,000, 10m 1:24,000, 30m
State and Federal Agencies Agricultural Extension Service	-%sand, %silt, %clay -rock fragment content Layer depths Available water capacity Bulk Density Infiltration rate Ksat Rooting depth Soil organic carbon Soil inorganic carbon Total carbon And other related layers	1:12,000, 10m 1:24,000, 30m
County Planners	-%sand, %silt, %clay -rock fragment content Bulk Density Layer depths Available water capacity Infiltration rate Ksat Rooting depth Soil organic carbon Soil inorganic carbon Total carbon And other related layers	1:6,000, 5m 1:12,000, 10m 1:24,000, 30m

Health Department	-%sand, %silt, %clay -rock fragment content Bulk Density Infiltration rate KSat Layer depths Available water capacity Rooting depth Soil organic carbon Soil inorganic carbon Total carbon And other related layers	1:6,000, 5m 1:12,000, 10m 1:24,000, 30m

Formatted: Indent: Left: -0.06"

Charge 5

Investigate ways and propose methods to provide end users with accuracy measurements for soil maps.

Current Soil Map Product

Formatted: Font: Verdana

Cartography / Visual Method
Variance maps
Large scale visualization products of component locations in map unit.
Map unit boundary distinctness.
Interpretations – Utilize a Decision Support System to select a single component to represent the map unit or use other data sources to identify the location of multiple components within the map unit boundary.

Formatted: Font: Verdana

Tabular / Text
Incorporate statistical metrics that describe the variability of soil properties within soil map units: Coefficient of Variation (CV) values and Standard Deviation for individual map units and soil properties in the attribute table. For raster-based soil maps: Regression coefficient R^2 , Mean Prediction Error, Root Mean Square Error.
Provide the number of pedons (measurements, lab data) per soil component used to make estimates in delivered dataset.
Date of soil survey completion.
Date of soil sample collection.

Formatted: Font: Verdana

Next Generation Product (SOLA, Soil Grid, Soil Pixel, Soil Voxel, SOLA Vox)

Formatted: Indent: Left: -0.13"

Cartography / Visual Method
Multi-temporal behavior – El Nino and La Nina performance of soil landscapes within MLRA
Maintain a spatial database record of all point observations to provide a foundation for soil map products.
3D soil-landscape models
Space-time models and maps
Disaggregation of map unit components (defuzzifying) so that it is clear **where**, ie. at which location, a component occurs with a map unit..

Formatted: Font: Verdana